## REMARKS/ARGUMENTS

Claims 4 and 6 are pending in this application.

Claims 4 and 6 were rejected under 35 U.S.C. § 102(b) as being anticipated by, or, in the alternative, under 35 U.S.C. § 103(a) as being unpatentable over Shinji (JP 2002-300001). Applicant respectfully traverses the rejection of Claims 4 and 6.

Claim 4 recites:

> **A lens** comprising:
> lithium tantalate including a lithium oxide and a tantalum oxide;
> wherein
> **a molar composition ratio of the lithium oxide and the tantalum oxide ($Li_2O/Ta_2O_5$) in the lithium tantalate is in a range of 0.975 to 0.982**; and
> **a birefringence of the lithium tantalate is in a range of -0.0005 to 0.0005**.

As described in paragraphs [0006] to [0008] of Applicant's originally filed Substitute Specification, lithium tantalate is well-known as a material for optical elements such as wavelength conversion element, optical diffraction element, phase conjugate mirror, for example. However, lithium tantalate has not previously been used for a lens because of a large birefringence based on the difference of the refractive indexes between an ordinary ray and an extraordinary ray.

However, the inventors of the present invention discovered that the birefringence is greatly reduced in lithium tantalate having the composition recited in Applicant's Claim 4, and that lithium tantalate having the particular composition recited in Applicant's Claim 4 can preferably be used as a lens, especially usable for natural light and light coming from various angles. Specifically, the lens recited in Applicant's Claim 4 comprises lithium tantalate having a molar composition ratio of lithium oxide and tantalum oxide ($Li_2O/Ta_2O_5$) in a range of 0.975 to 0.982. The birefringence can be confined within a range of ±0.0005 in lithium tantalate having this particular molar composition ratio, whereas with a well-known stoichiometric composition or a congruent composition as the molar composition ratio of the lithium tantalate, the birefringence cannot be confined within a range of ±0.0005 in lithium tantalate.

In this manner, a miniaturized and thin lens utilizing a high refractive index (i.e., more than 2.0) of the lithium tantalate can be provided (see for example, paragraphs [0006], [0054], [0055] of Applicant's originally filed Substitute Specification and Figs. 4 and 5 of Applicant's originally filed drawings).

Furthermore, the lens as recited in Applicant's Claim 4 can be used not only for laser light that can generate a mono-dispersed wavelength, but also for natural light and light coming from various angles because it is not necessary to control the angle between incoming light and the optical axis of the lithium tantalite in advance (see, for example, paragraphs [0024], [0069] of Applicant's originally filed Substitute Specification). Since the confining angle between the incident direction of light and the optical axis is unnecessary with the lens recited in Applicant's Claim 4, an optical system can be freely designed more flexibly and at reduced costs.

The lens recited in Applicant's Claim 4 is capable of obtaining an increased effective diameter (NA) as compared to existing lenses, such as glass lenses, and thus, the brightness is increased (see, for example, paragraph [0058] and Table 1 of Applicant's originally filed Substitute Specification).

As a result, the effective aperture of the lens recited in Applicant's Claim 4 can be reduced as compared to existing lenses. Thereby, if the lens recited in Applicant's Claim 4 is used for optical electronic devices, such as an endoscope, a magneto optical disk, and a digital camera, the optical electronic devices can be miniaturized.

As shown from the relationship between the molar composition ratio and the refractive index in Fig. 2 of Applicant's originally filed drawings, the range of ±0.0005 of the birefringence can be achieved in lithium tantalate with a molar composition ratio that is deviated from the stoichiometric composition ($(Li_2O/Ta_2O_5)$ =1.00).

The range of ±0.0005 of the birefringence in lithium tantalate can be achieved in a range of the molar composition ratio that is slightly shifted from the stoichiometric composition toward the Li deficient side. The range of ±0.0005 of the birefringence cannot be achieved with the well-known stoichiometric composition or with the congruent composition as the molar composition ratio of the lithium tantalate.

Shinji is directed to providing a substrate for a surface acoustic wave device made of a lithium tantalate single crystal which has excellent uniformity (see, for example, paragraph [0007] of Shinji). To achieve this excellent uniformity, Shinji discloses that a rate of change of the velocity of a surface acoustic wave is 0.15% or less when an extraordinary optical refractive index is in a range of 2.1767 to 2.1795 and a double refraction value (birefringence) is in a range of 0.0004 to 0.0032 in the lithium tantalate single crystal. Thus, Shinji discloses that a surface acoustic wave device having excellent uniformity of the velocity of a surface acoustic wave is obtained by providing a lithium tantalate single crystal meets having an extraordinary optical refractive index in the range of 2.1767 to 2.1795 and a double refraction value (birefringence) in the range of 0.0004 to 0.0032.

The Examiner alleged, "Shinji discloses a substrate material for optoelectronic devices (reads on lens) that comprises a lithium tantalate single crystal." Although Shinji discloses that the lithium tantalate single crystal is used as a substrate material for electronic components, these electronic components are completely different from the lens recited in Applicant's Claim 4 and the optical electronic device including the lens recited in Applicant's Claim 6.

Specifically, Shinji discloses that the electronic component disclosed therein is a surface acoustic wave device. The surface acoustic wave device is a device that utilizes surface acoustic waves generated by a piezoelectric effect of interdigitated electrode fingers which are disposed on a piezoelectric substrate. The piezoelectric substrate must have piezoelectricity and is completely different from a lens that, by definition, refracts, diffuses, or focuses light. Shinji fails to teach or suggest that the lithium tantalate single crystal disclosed therein could or should be used for a lens, or even that lithium tantalate is suitable for use for a lens. Further, the optical electronic device recited in Applicant's Claim 6 specifically requires a lens, and cannot possibly be fairly construed as the surface acoustic wave device of Shinji which clearly does not and cannot possibly include a lens.

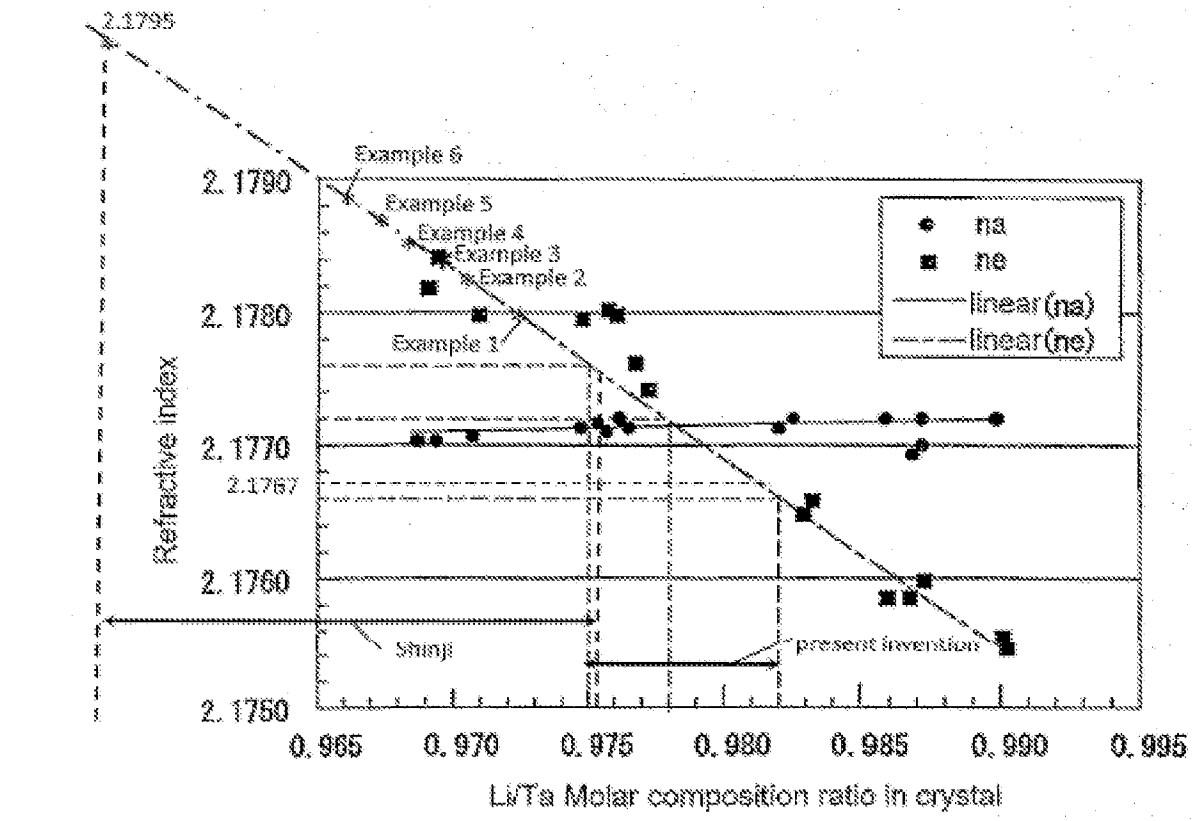
Accordingly, the lithium tantalate single crystal used for the substrate for the surface acoustic wave device of Shinji is completely different from the lithium tantalate single crystal of the lens recited in Applicant's Claim 4, and cannot possibly be fairly construed as the lens recited in Applicant's Claim 4.

As noted above, Shinji discloses a lithium tantalate single crystal having the extraordinary optical refractive index of 2.1767 - 2.1795 and the double refraction value (birefringence) of 0.0004 - 0.0032. As acknowledged by the Examiner, Shinji discloses a portion of the range of $\pm$0.0005 of birefringence recited in Applicant's Claim 4. However, Shinji clearly fails to teach or suggest a molar composition ratio of lithium oxide and tantalum oxide ($Li_2O/Ta_2O_5$) in a range of 0.975 to 0.982 as recited in Applicant's Claim 4, which is suitable for a lens.

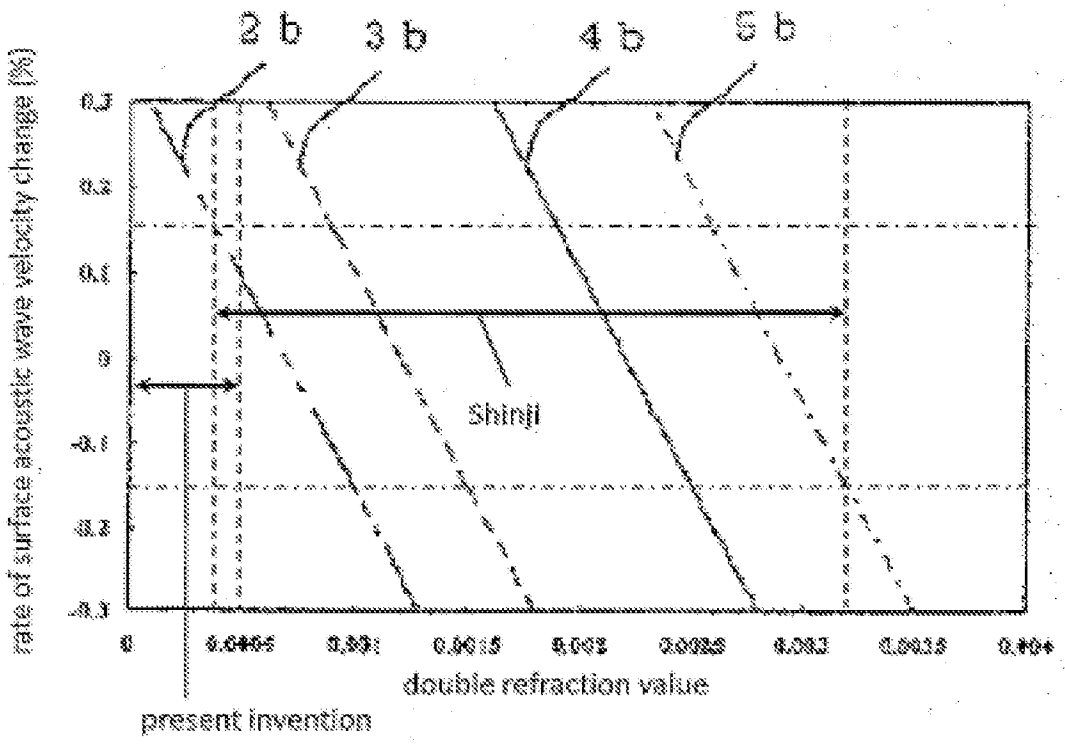
Thus, Shinji clearly fails to teach or suggest the features of "[a] lens" and "a molar composition ratio of the lithium oxide and the tantalum oxide ($Li_2O/Ta_2O_5$) in the lithium tantalate is in a range of 0.975 to 0.982" as recited in Applicant's Claim 4.

Further, a relationship between the lithium tantalate single crystal disclosed in Shinji and the lithium tantalate recited in Applicant's Claim 4 and examples/embodiments of Shinji are shown in the following Referential Figures 1 and 2 which correspond to Fig. 2 of Applicant's originally filed drawings and Fig.1 of Shinji, respectively.

Referential Figure 1



Referential Figure 2




According to Referential Figures 1 and 2, the lithium tantalate single crystal of Shinji includes the range of 0.0004 -0.0005 of double refraction (birefringence) which encompasses a portion of the birefringence of lithium tantalate recited in Applicant's Claim 4. However, the lithium tantalate single crystal of Shinji is used for a completely different purpose than the lithium tantalate recited in Applicant's Claim 4.

Referring to examples/embodiments 1—6 (Table 1) of Shinji and Referential Figure 1, Shinji only performed experiments using lithium tantalate single crystals having molar composition ratios having very different values from the molar composition ratio (0.975 – 0.982) recited in Applicant's Claim 4. Shinji clearly failed to perform any experiments using lithium tantalate having any molar composition ratio that falls within the range recited in Applicant's Claim 4. Thus, not only does Shinji fail to teach or

suggest the feature of "a molar composition ratio of the lithium oxide and the tantalum oxide ($Li_2O/Ta_2O_5$) in the lithium tantalate is in a range of 0.975 to 0.982" as recited in Applicant's Claim 4, but Shinji also fails to even recognize that a lithium tantalate could or should have a molar composition ratio in a range of 0.975 to 0.982 as recited in Applicant's Claim 4.

Shinji discovered a relationship between a rate of change of the velocity of a surface acoustic wave, an extraordinary optical refractive index, and value of double refraction (refer to Fig. 1 of Shinji), and achieved a preferred rate of change of the velocity of a surface acoustic wave, i.e., 0.15% or less, in the lithium tantalate single crystal having an extraordinary optical refractive index in a range of 2.1767 to 2.1795 and a value of double refraction in a range of 0.0004 to 0.0032.

In contrast, the present invention is directed to reducing the birefringence of lithium tantalate so as to enable lithium tantalate to be used for a lens. The inventors of the present invention discovered a relationship between the molar composition ratio and the birefringence (see, for example, Fig. 2 of Applicant's originally filed drawings), and that a range of ±0.0005 of the birefringence, which is suitable for a lens, is obtained in lithium tantalate which has a molar composition ratio in a range of 0.975 to 0.982.

Shinji neither teaches nor suggests any relationship whatsoever between a molar composition ratio and a double refraction value (birefringence). Although Shinji teaches a lithium tantalate single crystal having a double refraction value (birefringence) of 0.0004−0.0005, Shinji certainly fails to teach, suggest, or recognize that a molar composition ratio of the lithium oxide and the tantalum oxide in lithium tantalate could or should be set in a range of 0.975 to 0.982 in order to provide a preferred double refraction value for a lens.

In addition, the range of double refraction of 0.0004 to 0.0032 as disclosed Shinji most certainly does not anticipate the range of double refraction (birefringence) of ± 0.0005 recited in Applicant's Claim 4. The Examiner is reminded that if a claim is directed to a narrow range, and the reference teaches a broad range, it may be reasonable to conclude that the narrow range is not disclosed with "sufficient specificity"

to constitute an anticipation of the claims. See, e.g., *Atofina v. Great Lakes Chem. Corp*, 441 F.3d 991, 999, 78 USPQ2d 1417, 1423 (Fed. Cir. 2006) wherein the court held that a reference temperature range of 100-500 degrees C did not describe the claimed range of 330-450 degrees C with sufficient specificity to be anticipatory.

Only 12.5% of the range of 0.0004 to 0.0032 for the double refraction of Shinji falls within the range of $\pm$ 0.0005 for the double refraction (birefringence) recited in Applicant's Claim 4, and 87.5% of the range of 0.0004 to 0.0032 for the double refraction of Shinji falls **outside** the range of $\pm$ 0.0005 for the double refraction (birefringence) recited in Applicant's Claim 4. Thus, contrary to the Examiner's allegations, Shinji clearly fails to teach or suggest the feature of "a birefringence of the lithium tantalate is in a range of -0.0005 to 0.0005" as recited in Applicant's Claim 4.

Further, the Examiner is reminded that inherency may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. *In re Oelrich*, 666 F.2d 578, 581 (CCPA 1981). *See also Ex parte Skinner*, 2 USPQ2d 1788, 1789 (BPAI 1986) ("[T]he examiner must provide some evidence or scientific reasoning to establish the reasonableness of the Examiner's belief that the functional limitation is an inherent characteristic of the prior art" before the burden is shifted to the applicant to disprove the inherency.).

The Examiner has failed to provide any evidence or scientific reasoning whatsoever to establish the reasonableness of the Examiner's belief that the feature of "a molar composition ratio of the lithium oxide and the tantalum oxide ($Li_2O/Ta_2O_5$) in the lithium tantalate is in a range of 0.975 to 0.982" as recited in Applicant's Claim 4 is an inherent characteristic of Shinji. Instead, the Examiner has merely made an unsubstantiated allegation that the feature of "a molar composition ratio of the lithium oxide and the tantalum oxide ($Li_2O/Ta_2O_5$) in the lithium tantalate is in a range of 0.975 to 0.982" would be inherent to the composition of Shinji. Thus, the Examiner has clearly failed to establish that Shinji inherently includes the feature of "a molar composition ratio of the lithium oxide and the tantalum oxide ($Li_2O/Ta_2O_5$) in the lithium tantalate is in a range of 0.975 to 0.982" as recited in Applicant's Claim 4.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection of Claims 4 and 6 under 35 U.S.C. § 102(b) as being anticipated by, or, in the alternative, under 35 U.S.C. § 103(a) as being unpatentable over Shinji.

In view of the foregoing remarks, Applicant respectfully submits that Claim 4 is allowable. Claim 6 depends upon Claim 4, and is therefore allowable for at least the reasons that Claim 4 is allowable.

In view of the foregoing remarks, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are solicited.

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

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